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AUTHOR	Wilkinson, William K.; And Others
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ABSTRACT

This report describes the efforts of the Office of Research and Extension of the North Carolina State University (NCSU) School of Education to develop vocal computer-assisted instruction (CAI) tutorials for blind junior college students, the rationale behind those efforts, the costs and means of funding for the project, and suggested ways in which such materials may be launched in the state school system. The overall purpose of Project VOCAB (Vocal Computer Assisted Instruction for the Blind) is to develop CAI which utilizes a voice response terminal enabling the computer to train and give feedback to the student user in a vocal response mode (i. e. the computer "talks" to the student). An estimated 4,000 visually handicapped persons in North Carolina could benefit from this means of instruction. NCSU and Pitt Technical Institute are cooperating in Project VOCAB and will be developing CAI modules in Basic Business Accounting and Introductory Data Processing. Funds for hardware and software necessary for this project are primarily being provided by the State Division of Services for the Blind. The CAI program will be initially located at Pitt Technical Institute with plans being made to identify three other schools in the state for expansion of the program. A selected reading list of 38 items is attached to the report. (Author/JDS)

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CAI FOR THE VISUALLY HANDICAPPED: PROMISING COLLABORATION BETWEEN TWO AND FOUR-YEAR SCHOOLS

by William K. Wilkinson, James L. Cole, & William L. Ballenger

Summer, 1976

Despite the fact that the cost of computer-assisted instruction was reported to be prohibitively high by Dr. Lamar Johnson of U.C.L.A. in 1969, he also predicted that schools would continue exploring its possibilities as a means of not just changing, but of developing truly innovative instruction in the community colleges (21). A review of the literature of just the past three years confirms his prediction(see selected readings list). In fact, CAI, as such instruction is called, has been written about at least as much as any other contemporary instructional method.

Although CAI has some potentially serious drawbacks, it also has tremendous potential. A report released by U.C.L.A. points out that CAI programs take a great amount of time to create, that hardware systems are expensive, and that useless duplication of efforts threatens to make CAI implementation very expensive, even in the long run (19). Yet evidence exists that CAI, once developed and validated, can be a very effective form of instruction (4). A number of studies have concluded that CAI is at least as effective, if not more effective, than traditional teaching approaches. Under the right circumstances, the per pupil cost is quite reasonable.

Even if computer-assisted instruction's cost does run higher than traditional approaches, there are some tutorial situations where its use may be especially cost-effective. One of these situations, education for the blind, is just now beginning to be explored by educators. Efforts have been made to have computers interface with blind students via braille printouts, for example. But CAI could be more effectively applied to training for the visually handicapped if the communication from the computer to the student were vocal communication.

An exciting, innovational project is under way in North Carolina, at the N.C. State University School of Education, where the Office of Research and Extension, under the direction of William L. Ballenger and James L. Cole, is developing vocal CAI training programs for the blind in accounting and data processing. The purpose of this report is to describe the efforts of the Office of Research and Extension to develop vocal CAI tutorials for blind junior college level students, to explain the rationale behind those efforts, to describe the means of funding for the project, to suggest ways in which such training materials and methods may be launched in the state school system, and to provide a list of selected readings for those interested in pursuing this subject further.

William K. Wilkinson is a Doctorial student at NCSU's Adult and Community College Department. He is working with Project VOCAB as a graduate assistant, helping develop programmed training materials.

Dr. James L. Cole is an Associate Professor in the NCSU Psychology Department and is acting as co-director for Project VOCAB, developing the system software.

William L. Ballenger is Project Manager and co-director for Project VOCAB, and Research Associate, NCSU School of Education, Office of Research and Extension.

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PROJECT VOCAB: Vocal Computer Assisted Instruction for the Blind

I. Rationale: The overall purpose of Project VOCAB is to develop computer-assisted instruction which utilizes a voice-response terminal which enables a computer to train and give feedback to the student in a vocal response mode (CAI/VR), i.e., the computer talks to the student. Under the direction of two members of the North Carolina State University's School of Education, William L. Ballenger and Dr. James L. Cole, Project VOCAB has three general objectives: to make a broader range of highly skilled jobs available for the visually handicapped; to upgrade both the quality and quantity of training techniques for the visually impaired, and to increase employability of the visually handicapped; through helping private industry re-engineer jobs for handicapped persons with advanced technical training and skills.

It has been estimated that there are potentially around four thousand visually handicapped persons across the state of North Carolina who could benefit from the development of improved means of technical instruction. Some efforts toward providing quality technical training for visibly impaired post high school students are currently being made: the Rehabilitation Services Program at Pitt Technical Institute in Greenville, N.C. is a case in point. Instructors at Pitt Tech are working with approximately twenty-five visually impaired students to facilitate their performance in the technical training programs available there.

Both the instructors and the students at Pitt Tech would like to have some form of training materials and methods which would make two highly visually oriented courses, Basic Business Accounting and Introductory Data Processing more accessible to the visually handicapped. As these courses are currently set up, the students are called upon to study ledger pages and manipulate arrays of symbols, such as tables of numbers. A one-to-one tutorial situation seems to be the most successful means of facillitative instruction used to date, and this is very costly in terms of instructor's and/or tutor's time. In a praise-worthy instance of mutual agreement, the educators at Pitt Tech and the educators involved with NCSU's Project VOCAB are going to cooperate with each other in the development of vocal computer-assisted training modules.

It is believed by those connected with Project VOCAB that CAI/VR can provide both the self-instructional tutorial and vocal approaches that seem necessary in this situation. The idea is to provide future programmers and data processors with enough information about accounting and data processing principles to be able to operate competently and efficiently in real-life work situations. To this end, Project VOCAB will provide the following services: assemble the computer hardware necessary to provide voice response CAI student work stations for visually handicapped students, modify existing CAI programs to provide a vocal approach to training in business accounting and data processing, and introduce and test and evaluate these programs in the technical institute/community college system.

II. Personnel required: Project VOCAB is essentially a two-part project involving the development of computer hardware (equipment) on the one hand, and the development of the instructional system (programs, etc.) on the other.

The project, then, calls for two co-directors, (the professors from the NCSU School of Education mentioned earlier). The first co-director is responsible for the overall management of the program, for the development of the hardware system, and for the translation of instructional programs into computer managed files. This is a full-time position. The second co-director is responsible for developing specific training procedures to be used in the CAI/VR programs and for the assembly of these instructional programs. This will be a half-time position.

In addition, a half-time programmer will be needed to do the actual translation of text into codes used by the voice synthesizer. At lease one half-time graduate student will write specific instructional sequences for the CAI/VR programs. The project will also use a part-time typist and clerk.

III. Project Development: Hardware and Software Systems: While in some ways more complicated, putting together the equipment necessary to make Project VOCAB work is less time consuming than the task of developing the software to accompany it. One co-director will select suitable programming languages and develop the necessary supporting computer programs. He will also design the CAI/VR student stations, which are intelligent terminals capable of both providing local vocal feedback and providing connection through the phone line with the primary computer managing the CAI, a HP2000 ACCESS System located at Triangle Universities Computation Center at Research Triangle Park, N.C. When these components are assembled and the "bugs" worked out of them, a good part of this co-director's objective will be accomplished. At the same time, the slow programming of the material being created under the eye of the second co-director must be achieved.

The primary objectives of the CAI programs are those one would find in good programmed or self-instructional manuals, with the added restriction that all stimuli must be verbal, not visual, so that they may be spoken. The educational material must be broken down into objectifiable, competancy-based units of training, and well-designed instructional frames must be written (25). If existing CAI programs fail to cover material the Pitt instructors feel is necessary, that material will have to be constructed from "scratch". The purpose of this instructional material is to facillitate and supplement the instruction given in the classroom to the non-handicapped, not to replace it. It is assumed that the blind are taking the same instruction as the sighted but require additional supplementary tutorials in special areas.

The instructional material will be based upon known principles of programmed learning. A major key to the development of such materials is the creation of a whole series of questions surrounding each item identified in the objectives as needed to be learned. The strategy followed in developing this material is dictated by the structure of the project: segments of the program will be written at NCSU; then they will be taken to Pitt Tech, where they will be administered to visually handicapped students. The success of each segment will be judged by the success of the students in mastering the learning material. Students will be asked to fill out feedback forms; they will also talk in person with project personnel, as they gather information useful to the revision process. It is anticipated that each segment will need several revisions before being judged "acceptable". The end product should lead the students to a 95% mastery level.

Of course, cost is a major factor whenever one discusses CAI. The equipment used in the development project is relatively expensive. For purposes of development, more sophisticated equipment is needed than will be necessary for production. Operational (rather than developmental) equipment for installation in additional institutions will be expected to cost only about half this amount. Computer time at TUCC at the Research Triangle Park will cost $200/month. The VOTRAX voice units cost $7100 each. The intelligent terminal and other essential equipment are also expensive, bringing total equipment costs for the pilot model to $19,575. However, the life of this equipment is estimated to range from eight to ten years. The projected budget is a total of $75,819 for fiscal 1976, and $77,321 for fiscal 1977. About 25% of this is equipment costs, the rest personnel costs.

Where does the money come from? The State of North Carolina is providing about $7000 is 1976 and about $8000 in 1977, in the form of release time for Dr. Cole. The Division of Services for the Blind is funding the remainder of the cost including the cost of the equipment: the equipment and the completed CAI modules remain its property when the project is concluded.

The cost of this project can be justified in several ways. First, this is a form of innovative development, and development is expensive, by its very nature. Options must be investigated during a development project that can be ruled out in production. It takes projects like this to determine how CAI/VR can be made practical at some time in the future. Also, educational programs for handicapped students will cost somewhat more than for those without a handicapp. If it can be shown that the situation Pitt Tech is facing (many visually handicapped students in need of instruction) is fairly typical across the state, then CAI/VR may be shown to be economically feasible in terms of the cost per student, as the number of students increases.

Getting the program launched at Pitt Tech should pose few difficulties, since the equipment necessary will be provided by the Project, and since the equipment will remain at Pitt as long as it provides such instruction for the visually handicapped through the Rehabilitation Services program. The CAI/VR programs will also be provided at no cost to Pitt Tech, as well. If the supplemental business accounting and data processing courses are well received, it should be possible to modify other courses which also have visual limitations. It might also be the case that certain courses such as speech or music might find CAI/VR to be a beneficial approach, at least for specified portions of the courses.

Once the program is established at Pitt, Project VOCAB has agreed to work with the Division of the Services for the Blind to identify three other schools in other sections of the state which either have a service for rehabilitation or need and want one. Efforts will be made to install the completed CAI/VR programs at these other schools. There will be little cost to these schools because the Division of Services for the Blind will augment equipment costs and will provide the completed programs.

It is encouraging to find this kind of inter-school cooperation; more often than not, universities and two-year schools are at each other's throats, in competition with each other. Though the cost factor must be taken into account, it is important for this kind of basic development to be carried out. If reasonably economical programs can be developed for the blind, this project will have achieved a meaningful breakthrough in higher education. The innovative nature

of a study like Project VOCAB lies in the fact that traditional subjects will be taught to non-traditional students through non-traditional methods, coupled with non-traditional equipment. The project seems well thought out, and one hopes that the services it is going to provide will meet with unqualified success.

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